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(54) Abstract Title

Laboratory animal cage

(57) A laboratory animal cage comprises a base 1, a lid 3 removably sealed to the base, an air inlet 35 and an air outlet 37. The air inlet 35 is provided in one of the base and the lid and incorporates first filter means 41 to filter air flowing into the cage. The air outlet 37 is also provided in one of the base and the lid and incorporates second filter means 43 to filter air flowing out of the cage.

Details of a seal (29, figures 1 and 6) between base 1 and lid 3 and a clip 55 to retain base 1 and lid 3 together are also disclosed.

The filters 41, 43 may be HEPA or roughing filters.

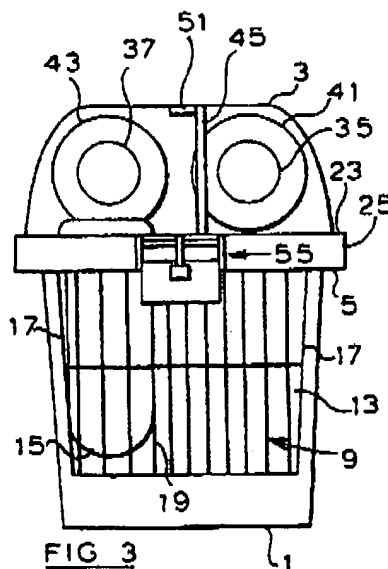


FIG 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

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ANIMAL CAGE

5 This invention relates to an animal cage, particularly for laboratory animals such as mice, rats, guinea pigs and the like.

10 It is often necessary to isolate laboratory animals from each other and from laboratory personnel and to this end laboratory animals are kept in sealed cages in order to protect the animals from contamination and/or to prevent contamination of laboratory personnel by such animals.

15 Nevertheless, it is very difficult to ensure there is no risk of cross-contamination.

20 For example, there is described in EP-A-0 724 828 a cage for laboratory animals which incorporates connections for the supply of fresh air and for the exhaust of foul air. The connections are inserted by way of a seal valve which is opened by the action of inserting a nozzle for the supply or exhaust of air and which is automatically closed as the nozzle is removed. There are several disadvantages with such an arrangement. For example, part of the seal valve is internal of the cage when the nozzle is inserted and external of the cage when the nozzle is removed. This can result in parts of the seal valve transmitting contamination between the interior and the exterior of the cage and also in part of the nozzle becoming contaminated

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and transmitting contamination. Further, once the nozzle is removed from the cage, no fresh air is thereafter introduced.

- 5 It is therefore an object of the present invention to provide an animal cage which eliminates or at least reduces the risk of cross-contamination.

10 According to the present invention there is provided an animal cage comprising a base, a lid removably sealed to the base, an air inlet provided in one of the base and the lid and incorporating first filter means to filter air flowing into the cage, and an air outlet provided in one of the base and the lid and incorporating second filter means
15 to filter air flowing out of the cage.

The first and second filter means may each comprise a roughing filter or a HEPA filter. The filter means may be a push fit with the remainder of the air inlet or air
20 outlet.

The lid may be removably sealed to the base by way of a labyrinth seal extending around the peripheries thereof. The labyrinth seal may include an elastomeric seal
25 extending continuously around the seal intermediate the base and the lid. The labyrinth seal may comprise a pair of continuous spaced protrusions provided on one of the base and the lid and a single continuous protrusion

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provided on the other of the base and the lid and adapted to be received in a space between the spaced protrusions. The space between the spaced protrusions may be tapered so as to narrow progressively in the direction of insertion of the single protrusion. The elastomeric seal may be provided in the space between the spaced protrusions. The inner of the spaced protrusions may be shorter than the outer of the spaced protrusions so as to engage with the other of the base and the lid in a manner which limits compression of the elastomeric seal. The spaced protrusions may be provided on the lid, for example depending therefrom, and the single protrusion may be provided on the base, for example upstanding therefrom.

The lid may be removably secured to the base, for example by clip means provided around the periphery of the cage, such as at opposite ends and/or sides of the cage.

The air inlet and the air outlet may be provided in the same one of the base and the lid, preferably the lid. The cage may include means for separating inflowing air from outflowing air to promote circulation of air within the cage.

Where the air inlet and the air outlet are provided in the lid, the first and second filter means may be provided within a cut-away portion of the lid. The cut-away portion may be provided with a removable cover.

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For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

5

Figure 1 is a diagrammatic side view of one embodiment of an animal cage according to the present invention;

10

Figure 2 is a diagrammatic end view of the animal cage shown in Figure 1 looking in the direction of the arrow A in Figure 1;

15

Figure 3 is a diagrammatic end view of the animal cage shown in Figures 1 and 2 looking in the direction of the arrow B in Figure 1;

20

Figure 4 is a diagrammatic plan view of the animal cage shown in Figures 1 to 3;

Figure 5 is a cross-sectional view of part of a rim of a lid of the cage shown in Figures 1 to 4; and

25

Figure 6 is a cross-sectional view of a clip for securing a lid of the cage to a base thereof.

The animal cage shown in Figures 1 to 6 comprises a base 1 and a lid 3. The base and the lid may be made of a

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transparent or translucent plastics material such as polypropylene, polycarbonate or polysulphone.

In the illustrated embodiment, the base 1 is formed with a laterally protruding flange 5 having a continuous protrusion in the form of an upstanding peripheral rim 7. A grating 9, for example of metal wire, is supported around the periphery thereof by the flange 5 and is formed with a depression having inclined faces 11 and 13 for receiving food and a water bottle 15. The sides of the depression are closed with metal plates 17 and the food and water bottle 15 are received in individual compartments separated by a metal plate 19. A drinking spout of the water bottle 15 protrudes through one of the inclined faces 11 and into the space within the base 1. The lower periphery of the flange 5 at each end of the base 1 is formed with a downwardly extending detent 21 which co-operates with a retaining clip to be described hereinafter.

The lid 3 is formed with a laterally protruding flange 23 which has a pair of continuous laterally spaced protrusions in the form of a depending peripheral rim 25 and an inner depending rim 27 spaced laterally inwardly of the peripheral rim 25. The peripheral rim 25 extends downwardly beyond the inner rim 27. Thus a recess is formed in the space between the depending rims 25 and 27, the recess accommodating an elastomeric seal 29. The seal 29 may be, for example, of silicone rubber tube (which

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could have an outer diameter of about 4.4 mm and a wall thickness of about 0.7 mm) formed into a continuous circle or of a strip of cellular plastics material, for example a cellular urethane material (which could have a width of about 4 mm and a thickness of about 3 mm) again formed into a continuous loop, such as the material sold under the trade mark PORON.

When the lid 3 is fitted to the base 1, the upstanding peripheral rim 7 of the base extends into the recess between the depending rims 25 and 27 of the lid and compresses the elastomeric seal 29. Overcompression of the seal 29 may be prevented by engagement of the inner depending rim 27 of the lid 3 engaging against the lateral flange 5 to limit penetration of the peripheral rim 7 into the recess between the depending rims 25 and 27.

As can be seen from Figure 5, the peripheral depending rim 25 is inclined outwardly at a small angle α which may be, for example, about 3 degrees, while the inner depending rim 27 is tapered, being inclined outwardly on the inner face thereof at an angle β which may be, for example, about 5 degrees and being inclined inwardly, more especially towards the free end thereof, at an angle δ which may be, for example, about 15 degrees. Because of the angles α and δ , the space between the rims 25 and 27 of the lid 3 is tapered and narrows progressively in the direction of insertion of the rim 7 and the rims 25 and 27 serve to

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guide and lock the upstanding peripheral rim 7 of the base 1 within the recess formed between the depending rims 25 and 27.

5 The lid 3 is formed with a gently curved airway guide portion 31 which extends above the food and water bottle compartments for about two-thirds of the length of the lid. The airway guide portion 31 terminates in a generally upright wall 33 which is provided with an air inlet
10 aperture having an air inlet tube 35 and with an air outlet aperture having an air outlet tube 37. The area between the base of the upright wall 33 and the end of the lid is closed by a laterally extending portion 39. The upright wall and the laterally extending portion form a cut-away
15 region which accommodates two filters 41 and 43 such as roughing filters or HEPA filters of conventional design for filtering inflowing and outflowing air. The height of the wall 33 is such that the filters terminate at a level below the top of the wall. The filter 43 for outflowing air may
20 incorporate an upstream pre-filter to extend the useful life of the primary filter.

Within the curved airway guide portion 31 is an upright dividing wall 45 which extends from the top of the guide
25 portion 31 substantially to the level of the base of the upright wall 33 along at least the majority of the length of the dividing wall. Thus the dividing wall separates inflowing air from outflowing air and, in combination with

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the profile of the airway guide portion 31, encourages circulation of air within the cage.

5 The filters 41 and 43 are secured to the inlet and outlet tubes 35 and 37 by friction resulting from a taper fit as is widely used for such filters. Inflowing air is supplied to the filter 41 and outflowing air is exhausted from the filter 43 by means of a conventional push fit connection (not shown) employing multiple resilient flanges as is well
10 known for such applications.

The free ends of the filters 41 and 43 terminate within the boundary of the lid 3 and this permits the filters to be enclosed within a removable cover 47. The cover 47 slides
15 onto the laterally extending portion 39 of the lid 3 and is secured with a clip 49 which engages in a recess 51 formed at the top of the upright wall 33. An end wall of the removable cover 47 is provided with two apertures 52 and 53 to facilitate passage of the push fit connections (not
20 shown). The removable cover 47 conforms to the general profile of the airway guide portion 31 and is aesthetically attractive: however, in addition the cover protects the filters 41 and 43 against accidental knocks and the like.

25 The lid 3 is removably secured to the base 1 by means of a retaining clip 55 provided in the illustrated embodiment at each end of the lid and co-operable with the downwardly extending detents 21 provided on the lateral flange 5. The

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- clip arrangement is shown in more detail in Figure 6. The retaining clip 55 is pivotably mounted on the depending peripheral rim 25 and is formed with an upwardly extending portion 57 for engaging with the peripheral rim 25 in a resilient manner for limiting opening movement of the clip and with a hooked portion 59 for engaging with the downwardly extending detent 21 of the base 1. Operation of the clip is by way of a depending lever portion 61.
- 10 The retaining clip 55 can be opened with minimal movement which is useful in the restricted circumstances of a protective environment. Accidental opening of the clip can be prevented by inserting a locking tie or a padlock (neither of which is shown) between a protrusion 63 formed
- 15 on the depending peripheral rim 25 and a co-operating protrusion 65 formed on the retaining clip 55.

- In use of the animal cage shown in Figures 1 to 6 the filters 41 and 43 provide complete and effective isolation
- 20 at cage level at all times, whether or not the cage is in position on a rack, which has not previously been possible. In combination with a conventional HEPA filtered air supply the animal cage according to the present invention can provide double HEPA filtered air, both in and out of the
- 25 system.

The labyrinth seal arrangement between the base 1 and the lid 3, preferably with the elastomeric seal 29, effectively

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prevents egress or ingress of air other than by way of the filters 41 and 43 under both positive and negative pressure regimes. In addition, the filters 41 and 43 allow a certain amount of safe ventilation when the air supply is not present.

All major components of the cage can be washed and autoclaved for cleaning purposes.

Where a lower level of isolation is acceptable, that side of the airway guide portion above the water bottle may be modified in a manner not illustrated to extend downwardly into the compartment for the water bottle and may be provided with a resilient X-flap seal to allow the spout of an external water bottle to be inserted through the seal and into the cage. Such an arrangement considerably simplifies animal management where a lower level of isolation is acceptable.

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CLAIMS

1. An animal cage comprising a base, a lid removably sealed to the base, an air inlet provided in one of the base and the lid and incorporating first filter means to filter air flowing into the cage, and an air outlet provided in one of the base and the lid and incorporating second filter means to filter air flowing out of the cage.
2. An animal cage as claimed in claim 1, wherein the first and second filter means each comprise a HEPA filter.
3. An animal cage as claimed in claim 1, wherein the first and second filter means each comprise a roughing filter.
4. An animal cage as claimed in any preceding claim, wherein the first filter means is a push fit with the remainder of the air inlet.
5. An animal cage as claimed in any preceding claim, wherein the second filter means is a push fit with the remainder of the air outlet.
6. An animal cage as claimed in any preceding claim, wherein the lid is removably sealed to the base by way of a labyrinth seal extending around the peripheries thereof.

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7. An animal cage as claimed in claim 6, wherein the labyrinth seal includes an elastomeric seal extending continuously around the seal intermediate the base and the lid.

5

8. An animal cage as claimed in claim 6 or 7, wherein the labyrinth seal comprises a pair of continuous spaced protrusions provided on one of the base and the lid and a single continuous protrusion provided on the other of the base and the lid and adapted to be received in a space between the spaced protrusions.

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9. An animal cage as claimed in claim 8, wherein the space between the spaced protrusions is tapered so as to narrow progressively in the direction of insertion of the single protrusion.

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10. An animal cage as claimed in claim 8 or 9, wherein the elastomeric seal is provided in the space between the spaced protrusions.

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11. An animal cage as claimed in claim 8, 9 or 10, wherein the inner of the spaced protrusions is shorter than the outer of the spaced protrusions so as to engage with the other of the base and the lid in a manner which limits compression of the elastomeric seal.

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12. An animal cage as claimed in any one of claims 8 to 11, wherein the spaced protrusions are provided on the lid and the single protrusion are provided on the base.

5 13. An animal cage as claimed in claim 12, wherein the spaced protrusions depend from the lid and the single protrusion is upstanding from the base.

10 14. An animal cage as claimed in any preceding claim, wherein the lid is removably secured to the base.

15 15. An animal cage as claimed in claim 14, wherein the lid is removably secured to the base by clip means provided around the periphery of the cage.

16. An animal cage as claimed in claim 15, wherein the clip means are provided at opposite ends and/or sides of the cage.

20 17. An animal cage as claimed in any preceding claim, wherein the air inlet and the air outlet are provided in the same one of the base and the lid.

25 18. An animal cage as claimed in claim 17, wherein the air inlet and air outlet are provided in the lid.

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19. An animal cage as claimed in claim 18, wherein the first and second filter means are provided within a cut-away portion of the lid.

5 20. An animal cage as claimed in claim 19, wherein the cut-away portion is provided with a removable cover.

21. An animal cage as claimed in any preceding claim and including means for separating inflowing air from
10 outflowing air to promote circulation of air within the cage.

22. An animal cage substantially as hereinbefore described with reference to, and as shown in, the accompanying
15 drawings.



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Application No: GB 9912031.3
Claims searched: 1-22

Examiner: Rhys Williams
Date of search: 18 October 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed. R): A1M (MAP, MAK, MEB)

Int Cl (Ed. 7): A01K (1/02, 1/03)

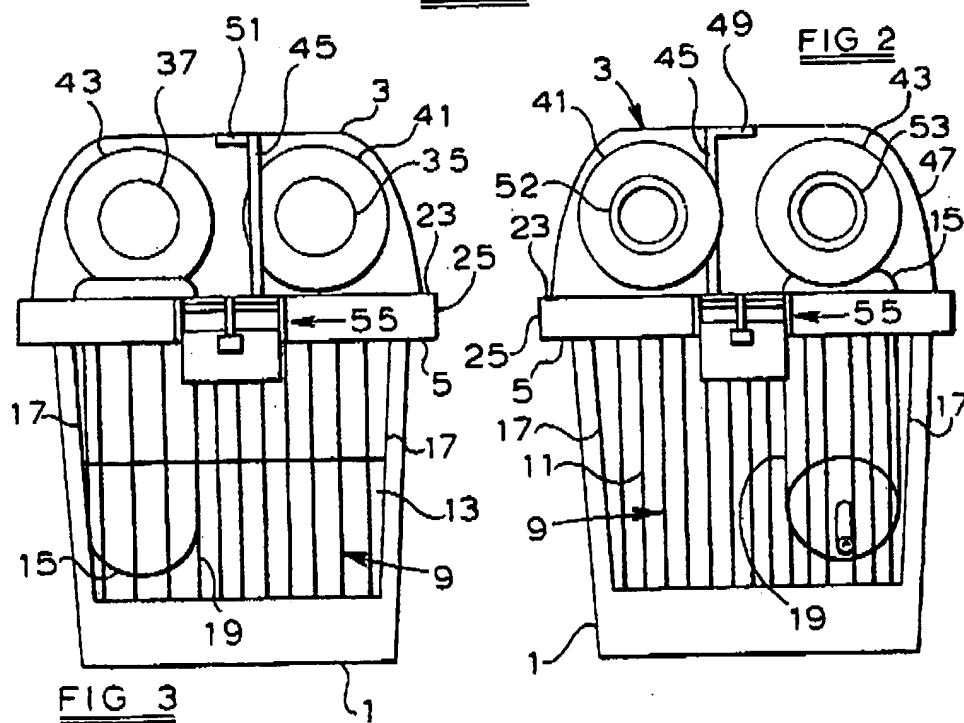
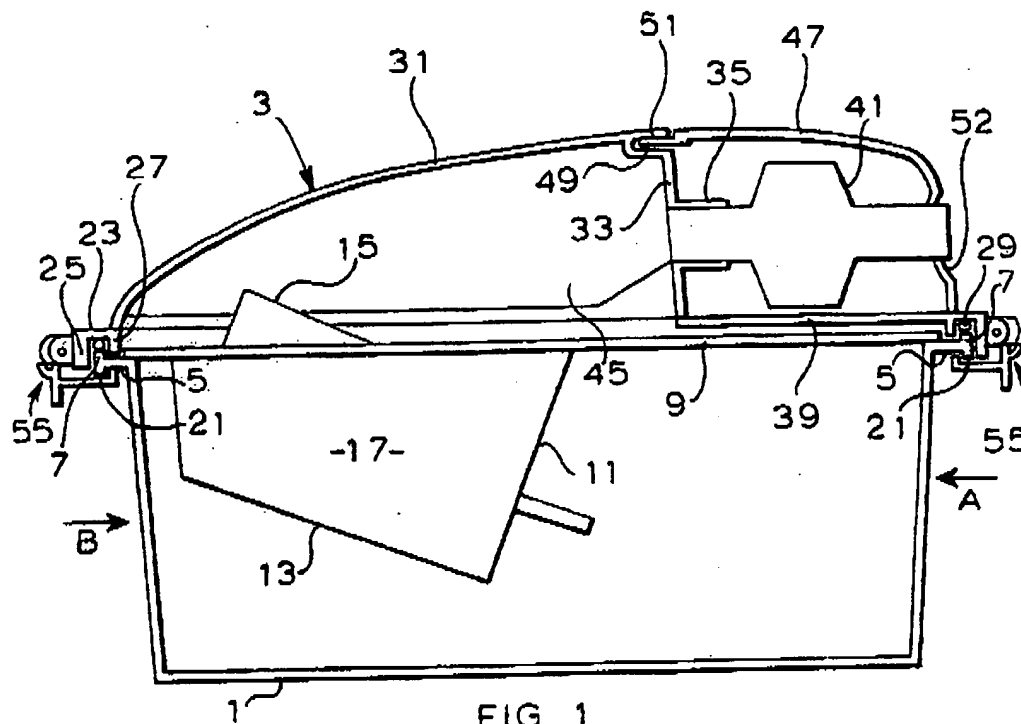
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Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US 5865144 (SEMENUK) See figure 3, column 4 lines 18-26 and column 5 lines 51-61.	1-3, 6, 7, 14 and 21

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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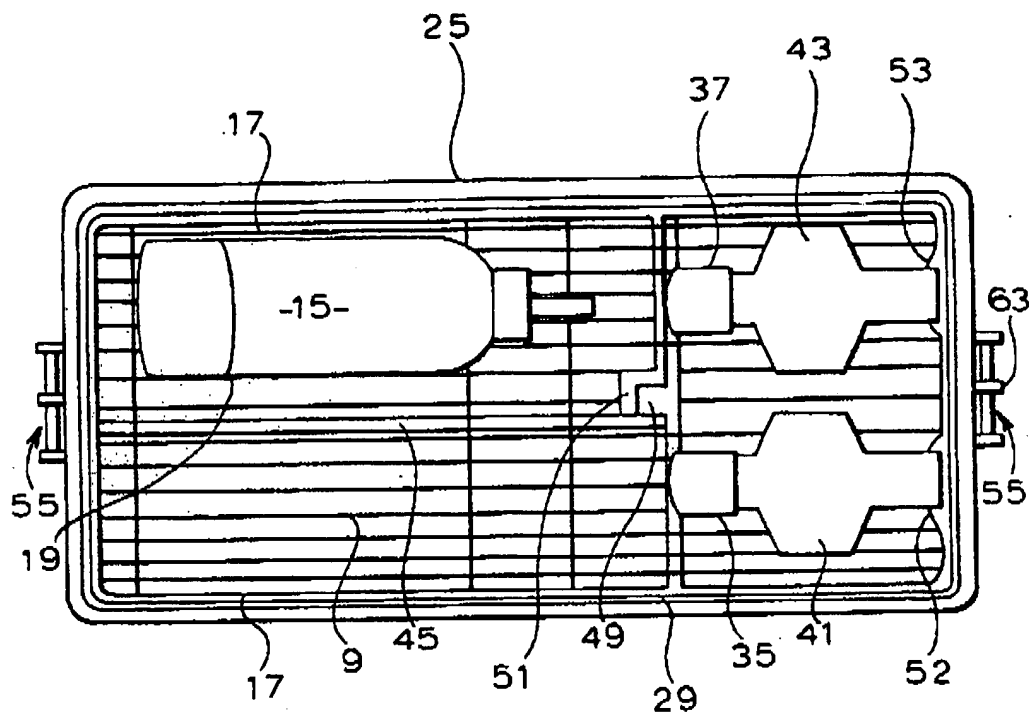


FIG 4

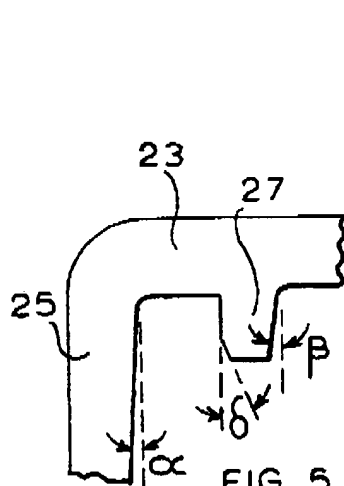


FIG 5

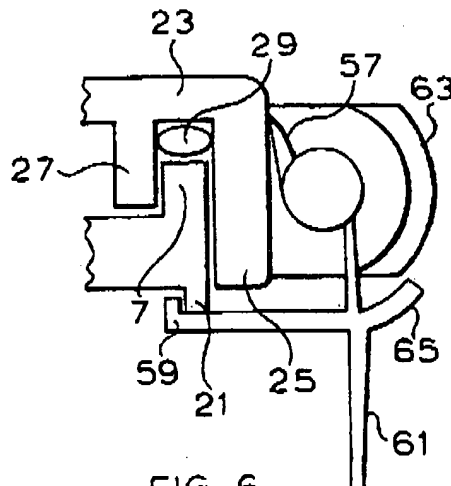


FIG 6

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